

REMARKS

Claims 1-23 were originally filed with this application. Claims 13-18 are currently withdrawn. Claims 2, 3, and 19-23 have been canceled. Claims 1-12 are currently amended. Support for the amendment to claim 1 can be found in, for example, claims 2 and 3 of the application as originally filed and in paragraph [0053] of the application as published (U.S. Patent Pub. No. 2006/0261007 A1). Support for the amendment to claim 4 can be found, for example, in paragraphs [0014] and [0053] of the application as published. Support for the amendment to claim 10 can be found, for example, in paragraph [0006] of the application as published. New dependent claims 24-29 have been added. Support for new dependent claims 24 and 25 can be found, for example, in FIG. 1 and paragraph [0053] of the application as published. Support for new dependent claim 26 can be found, for example, in paragraph [0061] of the application as published. Support for new dependent claim 27 can be found, for example, in paragraph [0027] of the application as published. Support for new dependent claim 28 can be found, for example, in paragraph [0039] of the application as published. Support for new dependent claim 29 can be found, for example, in paragraph [0037] of the application as published. As a result, claims 1, 4-12 and 24-29 are pending for examination with claims 1, 4, and 10 being independent claims. No new matter has been added.

Election/Restriction

The provisional election of the claims of Group 1, claims 1-12 and 19-23, made telephonically by Mr. Pasquale Mussacchio on 10/14/2008 is hereby affirmed. As such, the claims of Group 2, claims 13-18 are hereby withdrawn from consideration.

Double Patenting

Claims 1-12 and 19-23 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-4, 6, 7, 9-11, and 13-19 of co-pending Application No. 11/179,391, claims 1-18, 20-25, and 30 of co-pending Application No. 11/316,593, claims 1-10 of co-pending Application No. 11/574,819, claims 1-25 of co-pending Application No. 11/912,859, claims 15-40 of co-pending

Application No. 10/569,565, and claims 1-25 of co-pending Application No. 10/774,041.

Claims 19-23 are presently canceled, and as such the double patenting rejection with regard to these claims is moot and should be withdrawn. Applicants respectfully disagree that any of claims 1-12 of the instant application should be rejected on the ground of obviousness-type double patenting. Notwithstanding this traversal, Applicants will submit a terminal disclaimer with respect to the cited co-pending applications once the instant claims are deemed allowable and should these claims as allowed be obvious over the cited claims of the cited co-pending applications.

Rejections Under 35 U.S.C. § 102

Claims 19-23 were rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,209,852 to Sunaoka et al. (hereinafter “Sunaoka”).

Claims 19-23 are currently canceled, rendering the rejection of these claims moot. Accordingly, withdrawal of the rejection of claims 19-23 under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious over Sunaoka is respectfully requested.

Claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,403,479 to Smith (hereinafter “Smith”).

Smith does not disclose each and every element of independent claim 1 and thus cannot anticipate independent claim 1. For example, Smith nowhere discloses “isolating a portion of permeate remaining present in [a membrane filtration] system when a filtration process is stopped” as recited in independent claim 1. Smith also fails to disclose “applying [a] gas to [a] portion of liquid permeate” let alone applying a gas to the portion of liquid permeate with a pressure “less than a bubble point of the membranes of the membrane filtration system” as recited in independent claim 1. Rather, Smith discloses a comparative example where permeate is delivered to membranes from a cleaning solution tank 27, presumably by means of a pump 24. (Smith at Col. 17, lines 51-53, Col. 19, lines 40-45). There would be no permeate

present in the cleaning tank after a filtration process has been performed and stopped because other than in the contrived comparative example disclosed, there would be no way for permeate to enter this cleaning solution tank – permeate would normally be sent to a permeate storage. (*See* Smith at Col. 20, lines 53-54). Further, Smith does not disclose that pressurized gas of any kind was applied to the permeate referenced in the comparative example.

Because Smith does not disclose each and every element recited in independent claim 1, independent claim 1 cannot be anticipated by Smith. Accordingly, reconsideration and withdrawal of the rejection of independent claim 1 under 35 U.S.C. § 102 as anticipated by Smith is respectfully requested.

Rejections Under 35 U.S.C. § 103

Claims 1-12 and 19-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Smith and Sunaoka.

Claims 19-23 are currently canceled, rendering the rejection of these claims moot. Accordingly, withdrawal of the rejection of claims 19-23 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Smith and Sunaoka is respectfully requested.

There is no *prima facie* case of obviousness of claims 1-12 over the combination of Smith and Sunaoka. Smith and Sunaoka could not have been validly combined, and even if combined, no alleged combination of these references could teach each and every element of independent claims 1, 4, or 10 or the claims which depend therefrom.

Smith could not have been validly combined with Sunaoka in the manner suggested to render obvious the subject matter of any of claims 1-12 because Smith teaches away from the use of permeate for backwashing hollow filter membranes as is taught by Sunaoka and as is recited in claims 1-12. Specifically, Smith states at Col. 9, lines 49-52 that “[i]t is not practical to back-flush fibers with permeate because the cleaning effect of permeate is solely due to hydraulic pressure and is therefore relatively ineffective.” Thus, because Smith teaches away from the use of permeate for backwashing membrane filters, Smith could not have been validly combined with

Sunaoka or with any other reference to render obvious the subject matter recited in any of claims 1-12.

One of ordinary skill in the art would not have been motivated to have combined the teachings of Sunaoka with those of Smith for the reason asserted in the Office Action or for any other. On pages 5-6 of the Office Action the Examiner asserts that one of skill in the art “would use the teachings of Smith for the backwashing steps in the teaching of Sunaoka because it is highly effective according to Smith.” However, what is asserted in Smith is that the method disclosed is effective for cleaning a biofilm from the surfaces of membranes in a bioreactor using a biocidal solution without releasing a quantity of biocide into the membrane bioreactor that would kill a significant number of beneficial microbes. (Smith Abstract; Col. 11, lines 22-29.) There is no disclosure, teaching, or suggestion in either Smith or Sunaoka that the method of Smith would be effective in accomplishing the object of the method disclosed in Sunaoka – removing coarse, hard, fine particles from the surfaces of hollow fibers immersed in condensate water obtained in a nuclear or thermoelectric power plant or industrial waste water with permeate utilized as backwash fluid without roughening the outer surfaces of the fibers. (Sunaoka at Col. 1, lines 8-13; Col. 3, lines 23-33; Col. 10, lines 58-64.)

One of ordinary skill in the art would not have been motivated to have combined a portion of a method for cleaning a biofilm from membranes with a biocide without releasing significant biocide outside the membranes as disclosed in Smith with a portion of a method for removing coarse particles from a membrane solution without significantly damaging the surfaces of the membrane as disclosed in Sunaoka. The two methods have very different objectives and address very different concerns – Smith does not recognize an object of minimizing damage to membranes during cleaning and Sunaoka does not recognize an object of minimizing the amount of backwash liquid which permeates through the membrane pores.

Further, neither Smith nor Sunaoka recognize or address concerns of reducing liquid permeate backwash waste or providing for low energy operation – advantages that may be achieved by backwashing filtration membranes by applying gas at a pressure below the bubble point the membranes to liquid permeate remaining in a filtration system after filtration is suspended, as is recited in each of independent claims 1, 4, and

10. A specific energy and waste saving advantage of certain embodiments of the invention is that the gas applied to the permeate on the lumen side can be deployed very quickly. Therefore, in addition to the saving made by not requiring a pump for a liquid backwash (as a compressor can be used for the air) the down time is minimized greatly as the air acts almost immediately whereas a pump takes some time to build the required pressure.

Sunaoka discloses embodiments of a process of cleaning filtration membranes including multiple aeration and multiple drain down steps. (Sunaoka at Col. 8, lines 24-30; Col. 8 line 63 – Col. 9, line 37.) This process is more energy intensive and produces more waste than embodiments of the method disclosed in the present application.

Smith also does not address the problem of reducing permeate backwash waste. Smith relies on cleaning membranes by providing a biocidal cleaning solution to membrane lumens, not a liquid permeate. As Smith does not use permeate for backwashing, Smith does not address reducing liquid permeate backwash waste.

One of skill in the art would not have believed that either Smith or Sunaoka disclosed, taught, or suggested anything that would be useful in designing a method of operating a membrane filtration system which provided for a reduced permeate backwash waste or operated with a reduced energy consumption. Accordingly, one of skill in the art would not have looked to Smith or Sunaoka, or have been motivated to have combined Smith and Sunaoka, to produce a low energy, low permeate waste producing process as claimed in the present application.

Even if combined, no alleged combination of Smith and Sunaoka could teach each element of any of independent claims 1, 4, and 10. Neither Smith nor Sunaoka disclose, teach, or suggest isolating liquid permeate remaining in a filtration system after filtration is suspended and using the portion of permeate for backwashing the membranes of a filtration system, as is recited in independent claims 1 and 4. Further, neither Smith nor Sunaoka disclose, teach, or suggest applying a gas at a pressure below the bubble point of a filtration membrane to a permeate as part of a backwashing process as is recited in each of independent claims 1, 4, and 10. Thus, claims 1, 4, or 10 cannot be obvious over Smith in view of Sunaoka.

Independent claim 10 is further non-obvious over any alleged combination of Smith and Sunaoka because independent claim 10 recites a method comprising “applying [a] liquid suspension to lumens of filtration membranes” and “filtering the liquid suspension through pores in walls of the filtration membranes [to] form[] liquid permeate on a shell side of a pressure vessel in which the filtration membranes are mounted.” This method is considerably different from and would require fundamentally different equipment and operating methodology than the equipment and methods disclosed in either Smith or Sunaoka, both of which disclose systems used for filtering a liquid suspension located on the outside of hollow filter membranes to produce permeate within the lumens of the membranes. (*See, e.g.*, Smith at Col. 14, lines 33-34: “In all cases this invention relies on cleaning from the permeate side, that is, through the lumens of the fibers;” Sunaoka at Col. 3, lines 36-46.)

Accordingly, reconsideration and withdrawal of the rejection of independent claims 1, 4, and 10 under 35 U.S.C. § 103 as obvious over the combination of Smith and Sunaoka is respectfully requested.

Dependent claims 5-9 and 11-12 depend either directly or indirectly from independent claim 4 and are patentable over any alleged combination Smith and Sunaoka for at least the same reasons as independent claim 4. Accordingly, reconsideration and withdrawal of the rejection of dependent claims 5-9 and 11-12 under 35 U.S.C. § 103 as obvious over the combination of Smith and Sunaoka is respectfully requested.

New Claims

New dependent claims 24-29 depend from independent claim 1 and are patentable over Smith and Sunaoka for at least the same reasons as independent claim 1.

CONCLUSION

In view of the foregoing Amendments and Remarks, this application is in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes that the application is not in condition for allowance, the Examiner is requested to call Applicants' attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this Response, including an extension fee that is not covered by an enclosed check please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,
Fufang Zha et al., Applicants

By: /Gregory Gerstenzang/
Gregory Gerstenzang, Reg. No. 59,513
Nicole Palmer, Reg. No. 58,943
Peter C. Lando, Reg. No. 34,654
LOWRIE, LANDO & ANASTASI, LLP
One Main Street
Cambridge, Massachusetts 02142
United States of America
Telephone: 617-395-7000
Facsimile: 617-395-7070

Docket No.: M2019-7033US
Memcor Ref. No.: IPD-C360-US
Date: February 23, 2009